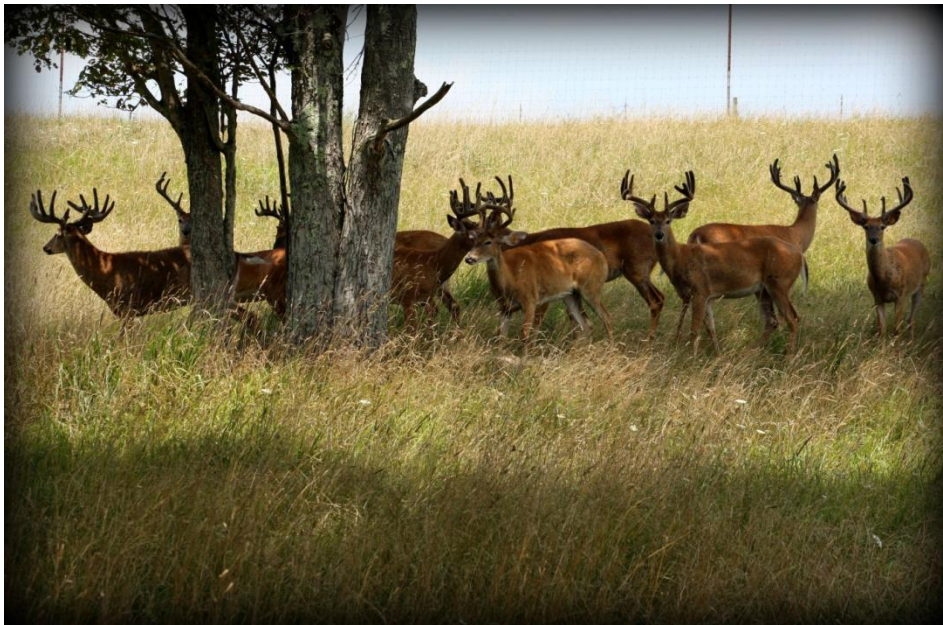


## Contribution of West Virginia's Cervid Farming Industry to the State Economy, 2010-2011



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The author is grateful to all the deer farm operators willing to provide data needed to undertake this study, the West Virginia Division of Natural Resources for distributing the survey, and the Alliance of West Virginia Champion Communities for initiating the study and assisting in data collection.

## Executive Summary

The West Virginia deer farming industry is a rapidly growing segment of the state's agriculture economy. Although the industry is small it provides a diversification opportunity and alternative income strategy for West Virginia small farms. It may be especially relevant to rapidly growing areas like the Eastern Panhandle where farmland preservation and maintaining the region's rural character is of importance.

Spending by the state's deer farmers creates increased demand for goods and services leading to additional purchases by regional businesses. This in turn generates new jobs, increased payments to workers, and the generation of new tax dollars. The results of these impacts were estimated using survey responses from 22 operations (59.5% response rate) and the Impact Model for Planning (IMPLAN). Results are presented below.

- **78%** of surveyed farmers **began their operations in the past 5 years.**
- Farm operations directly employ **46 workers** and pay more than **\$343,000** in wages, salaries, and fringe benefits.
- Farms spent an estimated **\$1.90 million** on capital and operating expenses over the past year. **97% of this spending occurred within the state.**
- As a result of deer farms' spending on inputs and payroll, an estimated **\$1.44 million in sales** were generated and **66 jobs** were supported.
- Impacts from deer farming operations lead to an estimated **\$784,000 in personal income** and **\$62,000** in estimated tax revenue.

## **Introduction**

The objective of this document is to describe the West Virginia captive cervid (deer farming) industry and provide estimates of the economic impact it contributes to the state. The industry is diverse and includes facilities producing breeding stock and semen, venison, those operating zoos, and those providing products and experiences targeting hunters, both on and off the farm. All of these activities provide an opportunity for generating economic impacts in West Virginia.

West Virginia deer farmers were surveyed to better understand the types of businesses, their sales, purchases, and growth in the industry. The database of captive cervid operators was prepared by the West Virginia Division of Natural Resources. In late September surveys (Appendix A) were mailed to 37 facility operators. Twenty-two (22) responses were obtained, for a survey response rate of 59.5%. The IMPLAN (Impact Planning) economic modeling system was used to generate economic multipliers and calculate the impacts of the cervid industry at the state level.

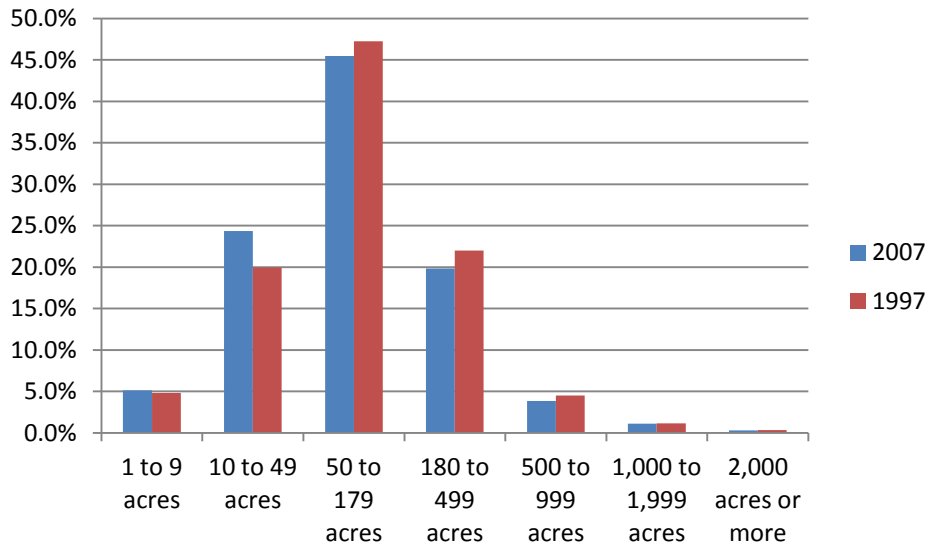
The analysis of the industry's impact is organized as follows: The first section provides an overview of general agriculture trends in West Virginia and trends in the West Virginia's cervid industry specifically. The second describes the procedures used to estimate spending impacts. Part three summarizes the economic impacts associated with the industry's employment, payroll, and expenditures. Finally, issues that should be considered by local stakeholders when interpreting results and considering policy decisions are discussed.

## **Trends in West Virginia's Agriculture and Cervid Industries**

West Virginia farms are small farms. While the number of farms in West Virginia has increased from 21,531 in 1997 to 23,618 in 2007, the size and value of farm products sold declined over the 10 year period (Table 1. Historical Highlights..., 2009).

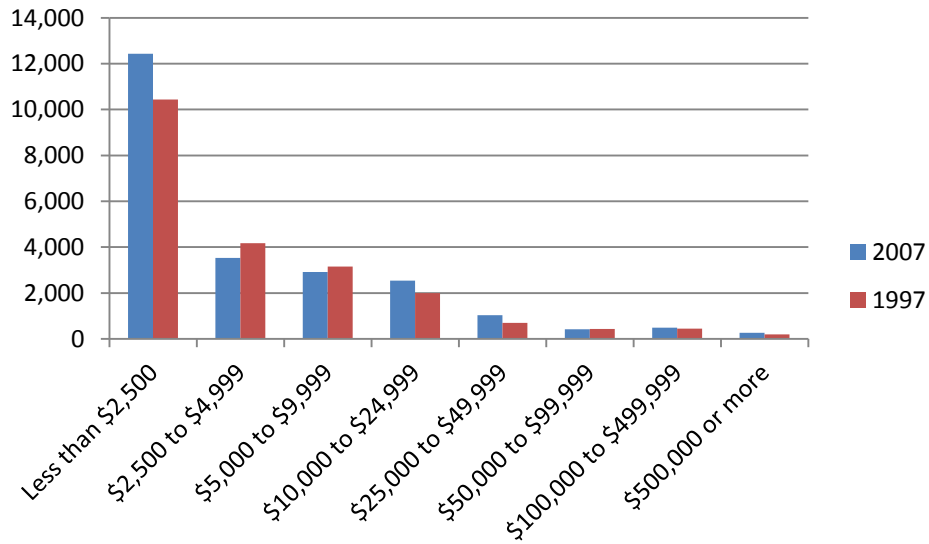
Figure 1 shows West Virginia's farms by size for the 1997 and 2007 periods. Between 1997 and 2007 the number of farms with 50 or more acres decreased across all categories while smaller farms between 1-9 acres and 10-49 acres increased nearly five percent (Table 1. Historical Highlights..., 2009).

**Figure 1. Farms by Size, 1997 and 2007**



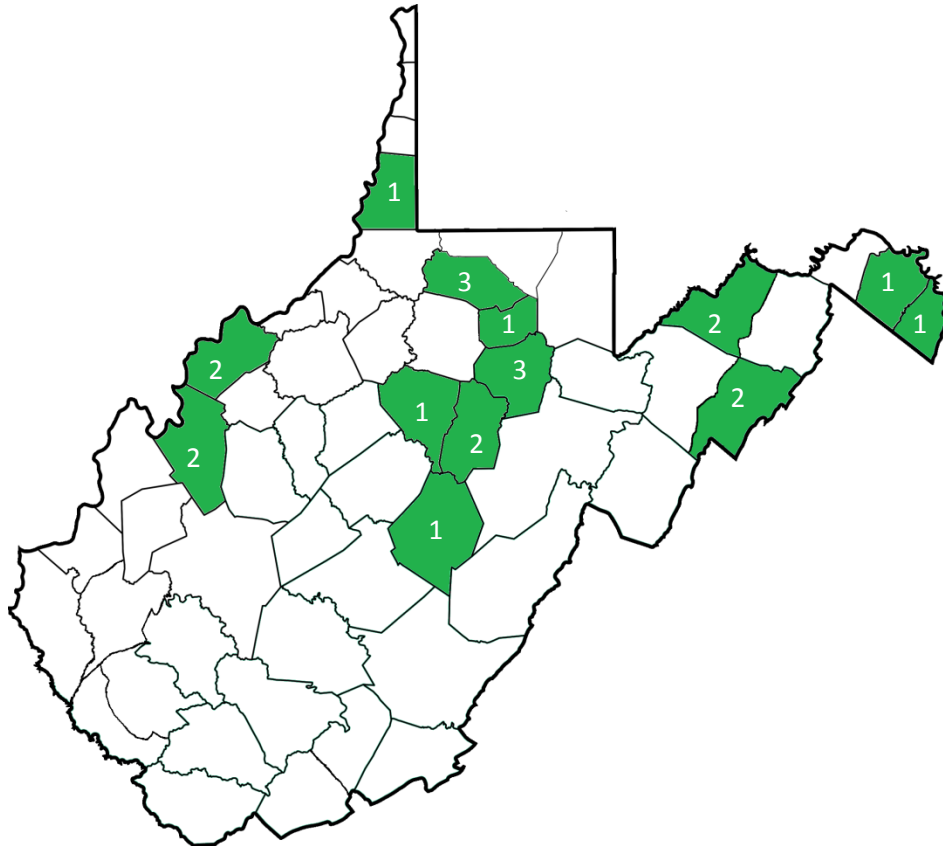
Likewise, the value of farm sales decreased (Figure 2). In 2007, nearly 50 percent of farms (12,433) had less than \$2,500 in sales, and the average market value of agricultural products sold was \$27,563 (down \$2,500 from 1997) (Table 1. Historical Highlights..., 2009). Because deer breeding provides an opportunity for farmers to diversify their operations and generate greater profits on smaller parcels of land than those afforded by traditional farming and ranching, they may be a particularly useful strategy for West Virginia small farms (Anderson, Frosch, and Outlaw, 2007).

**Figure 2. Farms by Value of Sales, 1997 and 2007**



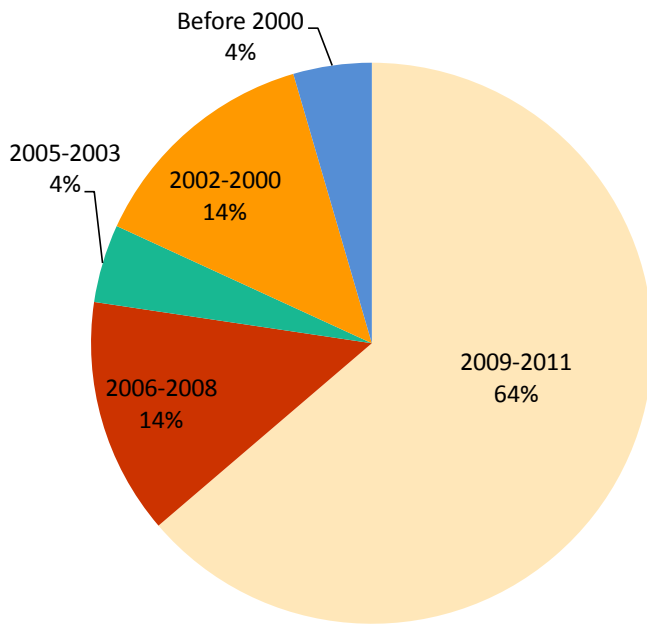
Captive cervid facilities are located across the state (Appendix B). Survey respondents from this study are from 13 counties (Figure 3). The majority of operations are in north central West Virginia (11 operations) and the Eastern Panhandle (6 operations).

**Figure 3. Location and Number of Survey Respondents by County**

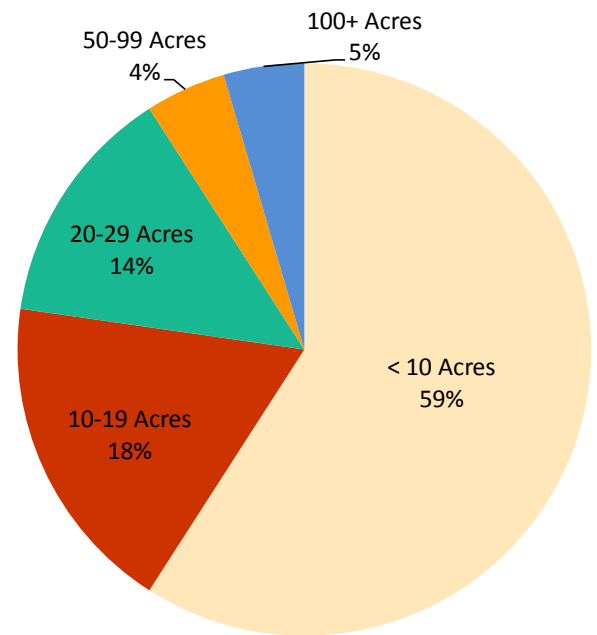


The deer farming industry in West Virginia is small compared to its neighbors. Pennsylvania and Ohio, both industry leaders, reported 928 and 695 farms respectively in 2009 (Economic Impact...2010). In 2002 the Census of Agriculture indicated 56 West Virginia farms with deer and three with elk (Table 31. Other Animals...2009). In 2007 the number of farms with deer had decreased to 26; however, the number of reported animals had increased nearly 27 percent to 1,620 (Table 31. Other Animals...2009). Surveys conducted for this study suggest that the industry is gaining strength. Seventy-eight percent (78%) of survey respondents established their operations in the past five years (Figure 4), and 64 percent were created in the last three years. Six were created in 2011 alone.

**Figure 4. West Virginia Deer Farms by Year Established**

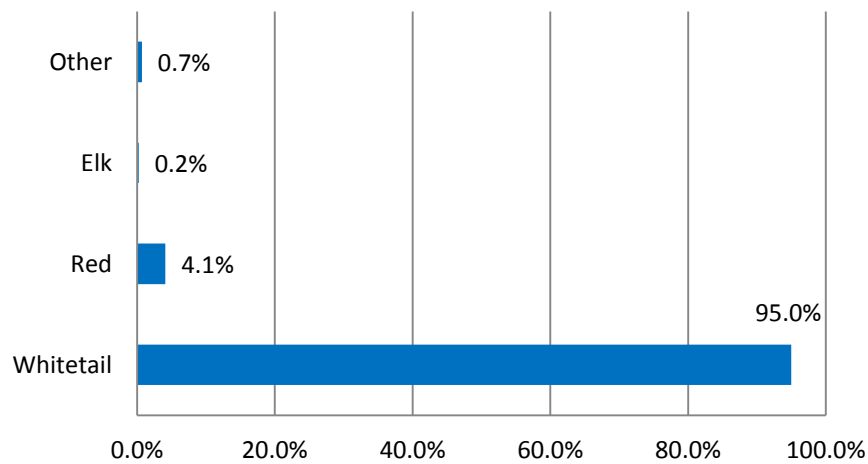


**Figure 5. West Virginia Deer Farms by Acres of Land**



Like most farms in West Virginia, the typical deer farm is a small farm, averaging 5.5 acres. One facility reported more than 300 acres; however the vast majority (59%) are less than 10 acres (Figure 5). The number of animals varies from less than five to more than 60; most farms raised 12 animals over the past year. Whitetail deer are by far the most common species produced, representing 95 percent of all animals (Figure 6). Red deer account for 4.1 percent of the animals and elk and other species comprise the remaining 0.9 percent.

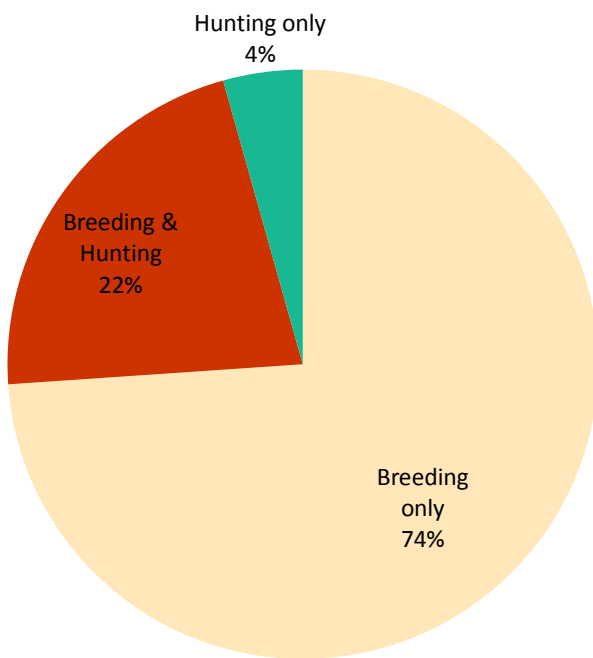
**Figure 6. Major Species**



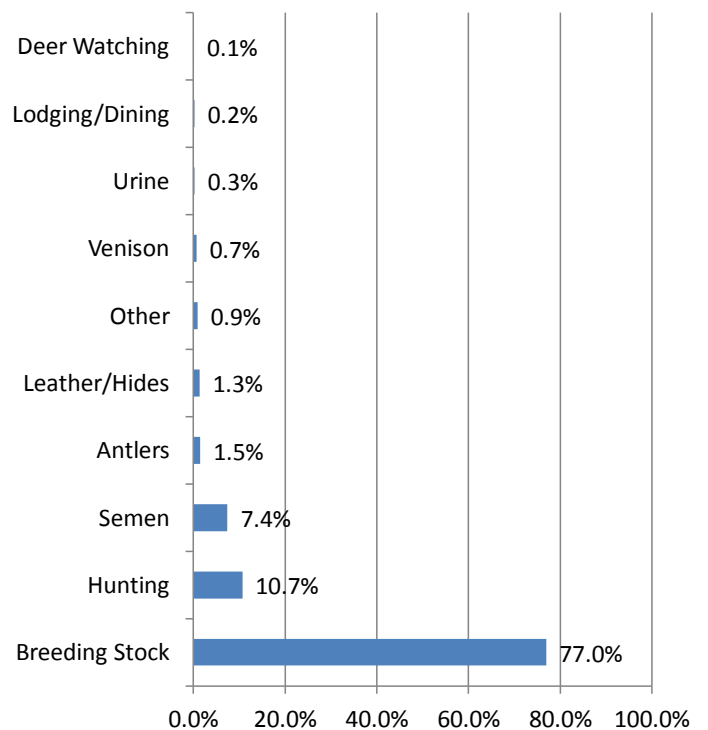
West Virginia’s deer farms are involved in several commercial activities and produce an assortment of products. Consistent with other studies (Anderson, Frosch, and Outlaw, 2007) breeding operations (74% of operations) represent the largest sector of the industry (Figure 7). The remainder offered hunting opportunities (4%) or engaged in a combination of hunting and breeding (22%).

Of those farms reporting sales, values ranged from less than \$2,000 to nearly \$80,000. The median value of sales for those reporting was \$22,000. Sales of farm products are dominated by breeding stock, which represents 77 percent of the industry’s sales (Figure 8)<sup>1</sup>. Many of these operations also produce specialty products such as urine, semen, antlers and hides (12% of industry sales). Hunting and deer watching accounted for 10.8 percent of industry sales. Encouraging these types of agritourism operations could provide an additional revenue stream for West Virginia deer farmers.

**Figure 7. West Virginia Deer Farms by Industry Segment**



**Figure 8. Sales of West Virginia Deer Farm Products**



<sup>1</sup> This distribution excludes one operation which generated a substantial percentage of sales from animal watching/zoo operations. Although this farm was not representative of the other survey respondents (and was thus excluded) it highlights the significant contribution deer farms can make to agricultural tourism.

## Data and Procedures

The first step in estimating the economic impacts of the West Virginia deer farming industry is to adjust for non-response and calculate the industry's direct impact. The WV DNR, which regulates the industry, has 37 farms on record. Survey responses were received from 22 farms (15 non-response). Data received from the survey were skewed either high or low; that is, some farms reported high sales, number of animals, wages, etc. while others, likely because they are new farms, reported low numbers. Therefore the median value, rather than the mean was used to adjust for non-response. Assumptions are presented in Table 1.

	From Surveys	Median	Non Response Value	Survey + Non-Response
Sales	\$300,300	\$950	\$14,250	\$314,550
Employment (WV) <sup>2</sup>	31	1	15	46
Wages, Salaries, Benefits (WV)	\$318,504	\$1,650	\$24,750	\$343,254
Intermediate Expenditures (Total)	\$1,347,498	\$36,508	\$547,620	\$1,895,118

West Virginia deer farmers participating in this survey reported annual sales of just over \$300,000. The median farm reported sales of \$950. When estimated sales of non-respondents are included the total sales of West Virginia deer farms are nearly \$315,000.

Fifty-five percent (55%) of West Virginia deer farm operations reported having a payroll in the past year. Operations employed a total of 34 employees, 31 of whom were West Virginia residents. Payroll for these employees totaled more than \$318,000. After adjusting for non-response, the total employment of the industry is estimated at 46 jobs and payrolls totaling over \$343,000.

Over the past year West Virginia deer farmers spent an estimated \$1.90 million on capital expenditures and operations. Local spending by the industry was high: \$1.86 million (97%) occurred within the state<sup>3</sup>. This included \$1.46 million in capital expenditures and more than \$403,000 in operating expenditures. The top ten expenditures are presented in Table 2.

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<sup>2</sup> The median number of employees, while small, seems to be a reasonable assumption. Ohio, which has a well developed industry, reported average employment of only 2.4 jobs per operation.

<sup>3</sup> Although this rate of local spending appears high, it is consistent with other research including Shepstone Management Company's 2010 impact study of the Ohio deer farming industry which reported intra-state spending of 87.7%.

Real Estate	\$559,741	30%
Farm Equipment	\$190,619	10%
ATVs	\$173,468	9%
Stock/Animal Purchases	\$149,752	8%
New Construction	\$136,198	7%
Fencing	\$118,909	6%
Vehicles	\$104,573	6%
Grains	\$79,718	4%
Supplement Feeds	\$46,767	3%
Fuel	\$39,528	2%

Real estate purchases (\$559,741) made up the largest share (30%) of expenditures over the past year. Other capital investments included the purchase of farm equipment (\$190,616), ATVs (\$173,468), and new animal purchases (\$149,752). Farms also spent heavily on new construction, most notably on fencing. Construction expenses represented 13 percent of operation spending and totaled more than \$255,000. Annual operating expenses on feed and supplements (7%) and fuel (2%) were also large expenditures.

### **Economic Impact Model Results**

An input-output (I-O) model of the West Virginia economy was used to estimate the contributions of the West Virginia captive cervid industry to the state economy. These models trace the flow of goods and services between industries, sales by industries to households and institutions, and the use of factors of production (labor and capital). The I-O model used in this study is based on the IMPLAN I-O Model package for the year 2009 and data from the survey conducted for this study.

Over the past year, spending by West Virginia deer farmers on inputs and labor contributed to the employment of 60 workers and nearly \$884,000 in sales<sup>4</sup>. Additional rounds of spending by input suppliers and workers spending their wages generated total employment impacts of **66 jobs, \$1.44 million** in sales, and **\$1.03 million** in gross state product, including nearly **\$784,000** in employee earnings and proprietors' income (Table 3).

<sup>4</sup> This value is smaller than the \$1.86 million for two reasons. First, it excludes real estate purchases which are a transfer of wealth within the region rather than an income generating activity. Second, it accounts for margining, or the dollar distribution among producers, wholesalers, and transportation sectors. For example, respondents indicated approximately \$9,500 spent on tires. However, few if any of those tires are manufactured in West Virginia. Therefore, money will be retained by state wholesalers and retailers, but the bulk of the expenditure will leak out of West Virginia to the region manufacturing the tires.

If capital expenditures are excluded from the model, the industry at current size and spending has an annual total impact of 52 jobs and nearly \$680,000 in gross state product, including more than \$543,000 in incomes to employees and proprietors.

Employment	66 jobs
Output	\$1.44 million
Value Added (Gross State Product)	\$1.03 million
Labor Income	\$783,762
Indirect Business Taxes	\$ 62,077
Other Property Income	\$185,082

In terms of employment, the agriculture and service sectors were most affected by farms' input spending and payroll. Specific sectors included animal production and retail establishments. Sectors with the largest increase in sales included the service sector (\$488,758 in sales), construction (\$281,486 in sales) and manufacturing (\$223,543 in sales). The greatest impacts in gross state product occurred in the service (\$282,708) and trade sectors (\$156,877). Large impacts in the service sector are primarily the result of household spending by workers directly employed by deer farm operations.

### **Considerations for Policy Makers**

In order to make the best decisions for the state of West Virginia, policy makers and local stakeholders should be aware of the limitations and assumptions of this study and the modeling process; specifically, impacts to the regional economy that may not be accounted for, the interpretation of impact measures like employment, and the role of economic impact analyses in policy decisions.

First, this study represents a snapshot of the deer farming industry over the past year. Many of the survey respondents are new operations (six created in the past year alone) and as such have likely not reached their full potential. The model presented here does not account for increased impacts to the agriculture and tourism sectors that could result from increased sales and spending in the future. Additionally, while the model accounts for the vast majority of spending by deer farm operations, it does not account for impacts associated with travel and spending on hunting equipment and accessories that may be related to hunting expeditions at West Virginia deer farms.

Second, because the impacts generated by I-O models are often used to justify economic development initiatives, it is important to understand how they operate and the assumptions that drive the models. For example, one of the largest concerns for policy makers are the employment impacts that businesses provide to the region. IMPLAN employment figures are based primarily on data from the Bureau of Labor Statistics ES-202 (unemployment insurance) program. This dataset only measures employed persons; it does not distinguish between full-time and part-time employment. Numbers presented should be interpreted as the sum of full-time, part-time, and seasonal jobs. Given the seasonal nature of agriculture, it is likely that many of the jobs generated by the deer farming industry will be part-time and seasonal in nature.

Finally, I-O models only describe economic impacts. They do not account for other issues surrounding development questions. For example, they do not address the needs or effects of expansion on the well-being of residents, or negative impacts that could result to other sectors of the economy. Likewise they do not address business/industry profitability, or constitute a feasibility or cost-benefit study. Readers and policy analysts should consider this report *one method* of analyzing the deer farming industry in West Virginia's economy.

## **Conclusions**

Although it is a small industry, captive cervid facilities are a rapidly growing segment of West Virginia's agriculture economy. Because the operations require little land, they may be a useful diversification and income generating strategy for West Virginia's small farms. As such they provide a means for farm families to sustain their way of life, preserve farmland, and maintain the state's rural character.

Based on the results of survey data and the state's I-O model, deer farm operations directly employed 46 workers, paid \$343,000 in wages, and purchased \$1.86 million from West Virginia businesses. As a result of these input and payroll expenditures, a total of 66 jobs, \$1.44 million in sales, and \$1.03 million in gross state product, including nearly \$784,000 in labor income were supported in the state's economy.

Many of the operations surveyed for this study were new operations and have likely not reached their full economic potential. Nurturing and encouraging these businesses could provide increased farm revenues and may dovetail well with the state's promotion of tourism, especially as it relates to agritourism, as a way to sustain rural economies. The industry is well developed in neighboring states (Ohio and Pennsylvania specifically) and recognized as a significant contributor to the states' agricultural economies. It may prove beneficial for West Virginia to encourage partnerships between interested parties to explore the success of the industry in

neighboring states and how it might be replicated in West Virginia to benefit small farms and rural communities.

## References

Anderson, David P., B.J. Frosch, and J.L. Outlaw. Economic Impact of the United States Cervid Farming Industry. Agricultural and Food Policy Center. The Texas A&M University System. APFC Research Report 07-4. August 2007.

“Economic Impact of the Ohio Deer Farming Industry.” Shepstone Management Company. January 2010.

MIG, Inc., IMPLAN System Version 3.0. [www.implan.com](http://www.implan.com), 2009

“Table 1. Historical Highlights: 2007 and Earlier Census Years.” 2007 Census of Agriculture, West Virginia State and County Data. United States Department of Agriculture, National Agricultural Statistics Service. December 2009.

“Table 31. Other Animals and Animal Products – Inventory and Number Sold: 2007 and 2002.” 2007 Census of Agriculture, West Virginia State and County Data. United States Department of Agriculture, National Agricultural Statistics Service. December 2009.

Photo on cover page courtesy of Mr. John Rose

## Appendix A. Survey Instrument

\*\*\* ALL INFORMATION WILL REMAIN CONFIDENTIAL \*\*\*

Which category best describes your operation:

- Breeding Only (Includes venison and urine collection)
- Breeding and Hunting
- Hunting Only

Year started \_\_\_\_\_ County \_\_\_\_\_

Total Acreage \_\_\_\_\_

Number and Species of Animals	
	Number
Whitetail Deer	
Fallow Deer	
Mule Deer	
Red Deer	
Reindeer	
Sika Deer	
Elk	
Other:	

Please provide information on your operations revenue generating activities over the past 12 months:

Sales of Farm Products (Annual Total)	
	Amount (\$)
Breeding Stock	\$
Semen	
Antlers	
Hunting	
Deer Watching	
Venison	
Urine	
Leather/Hides	
Lodging/Dining	
Other:	

**Employment and Payroll at farm/operation:**

A. Employment: Total **number of employees** by Wages/Salary level and **State of residence** (Over the last 12 months):

Income	Less than \$10,000	\$10,001 to \$15,000	\$15,001 to \$25,000	\$25,001 to 35,000	\$35,001 to \$50,000
WV					
OTHER					

Income	\$50,001 to \$75,000	\$75,001 to \$100,000	\$100,001 to \$150,000	\$150,000 and above
WV				
OTHER				

B. Total **annual** employee compensation: The **dollar amount of Gross wages and salaries paid plus fringe benefits** for employees by Wages/Salary level and **State of residence** (Over the last 12 months):

Income	Less than \$10,000	\$10,001 to \$15,000	\$15,001 to \$25,000	\$25,001 to 35,000	\$35,001 to \$50,000
WV	\$	\$	\$	\$	\$
OTHER	\$	\$	\$	\$	\$

Income	\$50,001 to \$75,000	\$75,001 to \$100,000	\$100,001 to \$150,000	\$150,000 and above
WV	\$	\$	\$	\$
OTHER	\$	\$	\$	\$

C. **If income ranges are NOT available**, please provide the following:

	Number of Employees as of Sept 2011	Total Gross Employee Wages, Salaries, and Fringe Benefits
WV		\$
OTHER		\$

**Vendors:** For your farm/operation, please list the dollar amount of purchases made for operations and maintenance *over the last 12 months*, by state where the vendor is located

	West Virginia	Other
<b>Stock/Animal Purchases</b>	\$	\$
<b>Feed and Related</b>		
Hay		
Corn		
Supplement Feeds		
Seed		
Fertilizers		
Pesticides and Chemicals		
<b>Equipment</b>		
Large Equipment (tractors, bobcat, etc.)		
Vehicles		
ATVs		
Rented Equipment		
Tires		
Vehicle Parts		
Trailers/Transport Crates		
Feed Bins		
Feeding and Watering Equipment		
Hand tools		
Video Equipment		
Coolers/Freezers		
Packaging Equipment		
<b>Facilities</b>		
Lodging Operations		
Dining Operations		
Fencing		
Maintenance and Repair		
New Construction		
<b>Veterinary</b>		
Veterinary Services		
Medicines		
Other:		
<b>Fuel and Utilities</b>		
Fuel		
Electric		
Natural Gas		
<b>Misc. Services</b>		
Advertising/Marketing		

Real estate		
Banking		
Legal Services		
Accounting and Tax Prep		
Insurance		
Permits		
Truck Transportation		
Animal Processing		
Taxidermy		
<b>Other Expenses</b>		

